

In The Claims:**Claims 1- 32 (canceled)**

Claim 33. (original) A semiconductor interconnect structure, comprising:

a conductive structure on a substrate;

a cap layer disposed on the conductive structure; and

a first dielectric layer over the conductive structure, wherein at least a portion of sidewalls of the conductive structure and the cap layer are surrounded by first level air gaps, an opening disposed over at least part of a surface of the conductive structure, wherein the first level air gaps are isolated from the opening.

Claim 34. (original) The interconnect structure of claim 33, wherein the conductive structure comprises a aluminum, copper, tungsten, polysilicon, metal, and metal alloy thereof.

Claim 35. (original) The interconnect structure of claim 33, wherein the material of the cap layer comprises doped dielectric.

Claim 36. (original) The interconnect structure of claim 33, wherein the material of the cap layer and the first dielectric layer are different.

Claim 37. (original) The interconnect structure of claim 33, wherein the etching selectivity of the cap layer with respect to the first dielectric layer is substantially high.

Claim 38. (original) The interconnect structure of claim 33, wherein the first dielectric layer comprises silicon oxide.

Claim 39. (original) The interconnect structure of claim 33, wherein the first dielectric layer comprises doped oxide.

Claim 40. (original) The interconnect structure of claim 33, wherein the first dielectric layer is formed by using a plasma enhanced chemical vapor deposition method (PECVD).

Claim 41. (original) The interconnect structure of claim 33, further comprising a second dielectric layer disposed over the first dielectric layer, wherein the opening exposes the conductive structure through the first dielectric layer and the second dielectric layer.

Claim 42. (original) The interconnect structure of claim 41, wherein the second dielectric layer comprises silicon oxide.

Claim 43. (original) The interconnect structure of claim 33, wherein the level of the top surface of the conductive structure is lower than a level of an interface between the first level air gaps and the first dielectric layer corresponding to a level between the conductive structure and the substrate.

Claim 44. (original) The interconnect structure of claim 33, wherein a height of an interface between the first level air gaps and the substrate is higher than a height of an interface between the conductive structure and the substrate.

Claim 45. (original) The interconnect structure of claim 33, wherein the width of the opening is substantially equal to the width of the conductive structure.

Claim 46. (original) The interconnect structure of claim 33, further comprising a layer over the first dielectric layer, wherein the layer is disposed over the first level air gaps and the opening disposed over at least a portion of the layer.

Claim 47. (original) The interconnect structure of claim 46, the width of the layer is substantially equal to the width of the opening.

Claim 48. (original) A semiconductor interconnect structure, comprising:

a conductive structure on a substrate;

a cap layer disposed on a portion of a top surface of the first conductive level conductive structure, the cap layer having a top surface, a first side surface and a second side surface, wherein the conductive structure and a lower portion of the first side surface of the cap layer are surrounded by first level air gaps and an upper portion of the first side is surrounded by the a first dielectric layer; and

an opening disposed over an upper portion of the conductive structure, the second side surface of the cap layer, and a portion of the first dielectric layer, wherein the first level air gaps are isolated from the opening by the first dielectric layer.

Claim 49. (original) The interconnect structure of claim 48, wherein the conductive structure comprises a aluminum, copper, tungsten, polysilicon, metal, and metal alloy thereof.

Claim 50. (original) The interconnect structure of claim 48, wherein the material of the cap layer comprises doped dielectric.

Claim 51. (original) The interconnect structure of claim 48, wherein the material of the cap layer and the first dielectric layer are different.

Claim 52. (original) The interconnect structure of claim 48, wherein the etching selectivity of the cap layer with respect to the first dielectric layer is substantially high.

Claim 53. (original) The interconnect structure of claim 48, wherein the first dielectric layer comprises silicon oxides.

Claim 54. (original) The interconnect structure of claim 48, wherein the first dielectric layer comprises doped oxides.

Claim 55. (original) The interconnect structure of claim 48, wherein the first dielectric layer is formed by using a plasma enhanced chemical vapor deposition method (PECVD).

Claim 56. (original) The interconnect structure of claim 48, further comprising a second dielectric layer disposed over the first dielectric layer, wherein the opening exposes the conductive structure through the first dielectric layer and the second dielectric layer.

Claim 57. (original) The interconnect structure of claim 56, wherein the second dielectric layer comprises silicon oxides.

Claim 58. (original) The interconnect structure of claim 48, wherein the level of the top surface of the conductive structure is lower than a level of an interface between the first level air gaps and the first dielectric layer corresponding to a level between the conductive structure and the substrate.

Claim 59. (original) The interconnect structure of claim 48, wherein a height of an interface between the first level air gaps and the substrate is higher than a height of an interface between the conductive structure and the substrate.

Claim 60. (original) The interconnect structure of claim 48, wherein the width of the opening is substantially equal to the width of the conductive structure.

Claim 61. (original) The interconnect structure of claim 48, further comprising a layer over the first dielectric layer, wherein the layer is disposed over the first level air gaps and the opening disposed over a portion of the layer.

Claim 62. (original) The interconnect structure of claim 48, the width of the layer is substantially equal to the width of the opening.

Claims 63- 65 (canceled)

Claim 66. (currently amended) ~~The interconnect structure of claim 63, further comprising~~ A semiconductor interconnect structure, comprising:

a pair of conductive structures;

a first dielectric layer over the conductive structures, wherein a first level air gap

disposed between the conductive structures in the first dielectric layer;

an opening disposed over at least part of the conductive structure, wherein the first level air gap is isolated from the opening; and

a cap layer disposed on a portion of a top surface of the first conductive level conductive structure, the cap layer having a top surface, a first side surface and a second side surface, the first side surface having a lower portion beside the first level air gap and an upper portion surrounded by a first dielectric layer; the opening disposed over the second side surface of the cap layer and isolated from the first level air gap.

Claim 67. (original) The interconnect structure of claim 66, further comprising an etching stop layer over the first dielectric layer, and substantially disposed over the first level air gap, wherein the first level air gap is isolated from the opening by the etching stop layer.

Claim 68. (original) The interconnect structure of claim 67, wherein the etching selectivity of the first dielectric layer with respect to the etching stop layer is substantially high.

Claims 69- 70 (canceled)

Claim 71. (currently amended) ~~The interconnect structure of claim 69, further comprising~~ A semiconductor interconnect structure, comprising:

a pair of conductive structures, wherein an air gap disposed between the conductive structures;

a dielectric layer over the conductive structures, the dielectric layer having a stop layer disposed over the air gap, wherein the dielectric layer has an opening exposing a portion of

~~the conductive structure and being isolated from the air gap; and~~

a cap layer disposed on a portion of a top surface of the conductive structure, the cap layer having a top surface, a first side surface and a second side surface, the first side surface having a lower portion beside the air gap and an upper portion surrounded by the dielectric layer, the opening being disposed over the second side surface of the cap layer and isolated from the air gap.

Claims 72- 73 (canceled)

Claim 74. (currently amended) ~~The interconnect structure of claim 72, further comprising A semiconductor interconnect structure, comprising:~~

~~a pair of conductive structures, wherein an air gap disposed between the conductive structures;~~

~~a dielectric layer over the conductive structures, the dielectric layer having a stop layer disposed over the air gap, wherein the dielectric layer has an opening disposed over at least a portion of the conductive structure and at least a top portion of the stop layer, the opening being isolated from the air gap; and~~

a cap layer disposed on a portion of a top surface of the conductive structure, the cap layer having a top surface, a first side surface and a second side surface, the first side surface having a lower portion beside the air gap and an upper portion surrounded by the dielectric layer, the opening being disposed over the second side surface of the cap layer and isolated from the air gap.

Claim 75. (canceled)